

S-NA - Lawrence J

WILLIAM DUPELL
LIBRARY

JUL 12 1966

UNIVERSITY OF KANSAS PUBLICATIONS
MUSEUM OF NATURAL HISTORY

HARVARD
UNIVERSITY.

Volume 17, No. 6, pp. 263-279

June 17, 1966

Taxonomic Notes on Some Mexican and Central American Hylid Frogs

BY

WILLIAM E. DUELLMAN

UNIVERSITY OF KANSAS
LAWRENCE
1966

UNIVERSITY OF KANSAS PUBLICATIONS, MUSEUM OF NATURAL HISTORY

Editors: E. Raymond Hall, Chairman, Henry S. Fitch,
Frank B. Cross

Volume 17, No. 6, pp. 263-279
Published June 17, 1966

UNIVERSITY OF KANSAS
Lawrence, Kansas

PRINTED BY
ROBERT R. (BOB) SANDERS, STATE PRINTER
TOPEKA, KANSAS

1966



31-3429

JUL 12 1966

HARVARD UNIVERSITY

Taxonomic Notes on Some Mexican and Central American Hyliid Frogs

BY

WILLIAM E. DUELLMAN

The acquisition of series of many species of hyliid frogs from México and Central America and the comparison of these specimens with the types of many named taxa have provided the basis for certain taxonomic conclusions. The purpose of this paper is to comment on certain species and to make necessary nomenclatural changes. In this report, eleven taxa are placed in the synonymy of nine others, one previously recognized species is regarded as a subspecies, and one species is placed in a different genus. The genera and species, as now recognized, are treated in alphabetical order.

The abbreviations used for the various collections are: AMNH (American Museum of Natural History), CNHM (Chicago Natural History Museum), FAS (Frederick A. Shannon collection), KU (University of Kansas Museum of Natural History), MCZ (Museum of Comparative Zoology), RCT (Richard C. Taylor collection), UMMZ (University of Michigan Museum of Zoology), and USNM (United States National Museum).

For the loan of specimens or for permitting me to work in their respective institutions, I am grateful to Charles M. Bogert, Doris M. Cochran, Robert F. Inger, Edmund Malnate, Jay M. Savage, the late Frederick A. Shannon, Hobart M. Smith, Charles F. Walker, Ernest E. Williams, and Richard G. Zweifel. This paper is a result of research on Middle American hyliid frogs supported by the National Science Foundation (Grant No. GB-1441).

Gastrotheca ceratophrys (Stejneger) New combination

Hyla ceratophrys Stejneger, Proc. U. S. Natl. Mus., 41:286, August 14, 1911 [Holotype.—USNM 47705, Upper Río Pequeni, Panamá Province, Panamá; A. H. Jennings collector].

This large and distinctive species heretofore has been known only from the holotype. The acquisition of three additional specimens, one a female carrying nine eggs, confirms a suspicion that the species belongs in the genus *Gastrotheca*. I have examined USNM 141795 from Tacarcuna, Darién, KU 77016 from Laguna,

Darién, KU 95794 from 5 kilometers west of Almirante, Bocas del Toro, Panamá, and the holotype. Three males have snout-vent lengths of 68, 72, and 74 mm., and the female (KU 77016) has a snout-vent length of 71 mm. The specimens are alike in having only a vestige of a web between the fingers and in having the toes webbed to the bases of the discs, except the fourth toe, which is webbed to the base of the antepenultimate phalanx. The anal opening is directed posteriorly at the level of the upper surfaces of the thighs. Contrary to the statement by Stejneger (1911:286), the skin on the head is not co-ossified with the underlying cranial bones. There are seven to nine transverse rows of minute tubercles on the dorsum of the head and body. The outer edge of the upper eyelid projects in the form of a triangular "horn," which is pointed in three specimens, but terminally notched in KU 95794.

Males are tan on the dorsum with darker brown transverse bands of varying widths (diffuse in USNM 141795) and have narrow brownish-black transverse stripes on the limbs. The belly is creamy white. The female is much darker than the males and has a dark brown dorsum, darkest laterally; the limbs are brown with dark brown transverse markings; the ventral surfaces are grayish tan. All specimens have a small white spot on each side ventrolateral to the anal opening and a pale bar extending from the orbit to the lip; in the female this bar is an enamellike white, whereas in the others the bar is creamy tan.

In life the female was pale tan when found at night; by day she changed to dull brown above and creamy-tan below with pale orange-tan thighs. The subocular bar, labial flecks, and subanal spots were white, and the iris was a dull bronze-color. The male from five kilometers west of Almirante had an olive-tan dorsum with brown transverse markings; the limbs were yellowish tan above with grayish brown bands, and the webs and flanks were yellowish tan. The upper lip was barred with olive-tan and brown; the venter was white, and the iris was a coppery bronze-color medially and a golden bronze-color peripherally.

Gastrotheca cornutum (Boulenger, 1898:124), which occurs on the Pacific slopes of Ecuador and Colombia, has superciliary triangular appendages like those in *G. ceratophrys*. Perhaps the two are conspecific, but on the basis of the limited number of specimens and the lack of an opportunity to examine the holotype of *G. cornutum*, I tentatively retain *G. ceratophrys* as a species.

Hyla colymba Dunn

Hyla colymba Dunn, Occas. Pap. Boston Soc. Nat. Hist., 5:400, August 18, 1931 [Holotype.—MCZ 10234, La Loma, Bocas del Toro Province, Panamá; Chester Duryea and E. R. Dunn collectors].

Hyla alvaradoi Taylor, Univ. Kansas Sci. Bull., 35:882, July 1, 1952 [Holotype.—KU 30886, Moravia, Cartago Province, Costa Rica; Edward H. Taylor collector].

Dunn (1924:3) originally reported this species from La Loma as *Hyla albomarginata* Spix; his specimens later formed the type series of *Hyla colymba* (Dunn, 1931a:400) and were compared with *Hyla albomarginata*. The holotype and an adult paratype each possess a circular mental gland encompassing most of the anterior edge of the chin; this gland was not mentioned by Dunn. Taylor (1952:882) based the description of *Hyla alvaradoi* on one adult male and subsequently (1954:625) reported two additional specimens from the type locality. Taylor (1952:882) gave a detailed description of the type of *Hyla alvaradoi*, and he noted the circular mental gland, but he did not compare *Hyla alvaradoi* with *H. colymba*.

Comparison of the holotypes of *H. alvaradoi* and *H. colymba* shows that the two specimens are nearly identical in structure; the former has fewer supernumerary tubercles on the hand than the latter, but a paratype of *H. colymba* (MCZ 10235) has as many supernumerary tubercles as the holotype of *H. alvaradoi*. The coloration of the types of the two alleged species and other specimens examined agrees and is distinctive. Although in life, the frogs are greenish yellow above, in preservative they fade to a creamy white with chromatophores forming flecks, or clusters, on the dorsum, especially anteriorly. A white or yellowish-white line from the canthus along the outer edge of the eyelid to a point above the insertion of the arm is a diagnostic feature of this species.

Hyla colymba ranges from low to moderate elevations on the Caribbean lowlands of Costa Rica to the Serranía del Darién in extreme eastern Panamá. I have examined specimens from La Lola and Moravia in Costa Rica and from the following localities in Panamá: La Loma, Chiriquí Province; El Valle, Coclé Province; Altos de Pacora, Panamá Province, and Laguna and Cerro Malí, Darién Province.

Hyla ebraccata Cope

Hyla ebraccata Cope, Proc. Acad. Nat. Sci. Philadelphia, 26:69, 1874 [Holotype.—unknown, Nicaragua; John F. Bransford collector].

Hyla weyeræ Taylor, Univ. Kansas Sci. Bull., 36:633, June 1, 1954 [Holotype.—KU 34850, Esquinas Forest Preserve, Las Esquinas, between

Palmar and Golfito, Puntarenas Province, Costa Rica; Mrs. Albert E. Weyer collector].

In his description of *Hyla weyeræ* Taylor (1954:635) did not compare the frog with *Hyla ebraccata*, but instead stated: "This small species may belong in a group of small frogs that includes *Hyla alleei*, *Hyla rufocula* (sic), and *Hyla uranochroa*. . . ." There are no morphological characters to associate *Hyla weyeræ* with *H. uranochroa* and its allies, but there exist no morphological characters by which to separate the holotype of *H. weyeræ* from *H. ebraccata*. All individuals of the latter are like the type of *H. weyeræ* in possessing an extensive axillary membrane, white labial stripe expanded below the eye, and unpigmented thighs. Most specimens (462 of 549 examined from Middle America) have a dorsal dark-mark roughly in the form of an hour-glass. The holotype of *H. weyeræ* differs by lacking any dorsal markings.

Examination of series of specimens from throughout the range of the species reveals the presence of plain (unmarked) individuals from several localities, but they always are in the minority as compare with individuals having the hour-glass mark on the back. Some individuals lack the hour-glass mark but have small dark brown spots on the dorsum; some specimens from the northern part of the range have the hour-glass mark fragmented into an anterior triangular mark and one or two spots in the sacral region (Table 1). The highest incidence of plain individuals is in the Palmar-Golfito area of Costa Rica (including the type locality of *H. weyeræ*), where six of 13 specimens have no dorsal markings.

I have collected plain and "normal" individuals from the same pond on the same night and can discern no differences in the breeding call. These observations and the occurrence of plain individuals at several localities on both Caribbean and Pacific lowlands of Central America indicate that the name *Hyla weyeræ* is based on a color variant of *Hyla ebraccata*.

Dunn (1931b:407, 1933:63) and Breder (1946:417) used the name *Hyla leucophyllata* (Beireis) for Panamanian frogs currently assigned to this species. Likewise, Taylor (1942:80) used that name for specimens from Piedras Negras, Guatemala. I am now convinced that all known specimens from México and Central America are *H. ebraccata*, which ranges into northern Colombia and differs from *H. leucophyllata* in having a white labial mark expanded below the eye. The lips of *H. leucophyllata* are uniform brown.

TABLE 1.—COLOR PATTERN VARIANTS IN *HYLA EBRACCATA*

Locality	Hour-glass	Triangle	Spotted	Plain	Total
Valle Nacional, Oaxaca, México.....	19	—	—	—	19
Teapa, Tabasco, México.....	13	2	—	1	16
Toocog, El Petén, Guatemala.....	47	6	—	—	53
Turrialba, Cartago, Costa Rica.....	87	—	—	—	87
Pacuare, Cartago, Costa Rica.....	48	—	—	—	48
Moravia, Cartago, Costa Rica.....	21	—	—	—	21
Suretka, Limón, Costa Rica.....	45	—	6	14	65
Tilarán, Guanacaste, Costa Rica.....	50	—	3	15	68
Palmar—Golfito, Puntarenas Costa Rica.....	7	—	—	6	13
Anchiote, Colón, Panamá.....	46	—	16	15	77
Cerro la Campana, Panamá, Panamá.....	16	—	3	—	19
Tacarcuna-Río Mono, Darién, Panamá.....	63	—	—	—	63
Totals.....	462	8	28	51	549

Several species in the *Hyla leucophyllata* group in the upper Amazon Basin (*H. bifurca*, *frontalis*, *laynei*, *membranacea*, *reticulata*, *rossalleni*, and *sarayacuensis*) differ only in minor features of the color pattern. *Hyla membranacea* is an unmarked species colored like the holotype of *H. weyeræ*, and *Hyla laynei* is spotted much like many individuals of *H. ebraccata*. The evidence presented here concerning variation in color-pattern in *Hyla ebraccata* suggests that detailed studies of living frogs and series of specimens of the *Hyla leucophyllata* group in the upper Amazon Basin might reveal an unwarranted multiplicity of named taxa.

Hyla elaeochroa Cope

Hyla elaeochroa Cope, Jour. Acad. Nat. Sci. Philadelphia, ser. 2, 8:105, 1876 [Lectotype.—USNM 30689, east foot of mountains near Sipurio, Limón Province, Costa Rica; William M. Gabb collector].

Hyla quinquevittata Cope, Proc. Amer. Philos. Soc., 23:273, April 1886 [Holotype.—USNM 14187, Nicaragua; J. F. Bransford collector].

Hyla dulcensis Taylor, Univ. Kansas Sci. Bull., 39:37, November 18, 1958 [Holotype.—KU 32168, Golfito, Puntarenas Province, Costa Rica; Edward H. Taylor collector].

Dunn and Emlen (1932:25) placed *H. elaeochroa* and *H. quinquevittata* as synonyms of *H. rubra*. Taylor (1952:861) concurred that *H. elaeochroa* and *H. quinquevittata* were conspecific but thought that *Hyla rubra* was another species. Taylor (1958:37) described *Hyla dulcensis* from Golfito on the Pacific lowlands of Costa Rica; he diagnosed the new species (based on two males and one female) as differing from *H. elaeochroa* on the Caribbean lowlands in having "somewhat larger size, smaller finger and toe discs, the obsolete canthus rostralis, the loreal region concave, and the choanae larger."

Examination of several series of specimens from Costa Rica and Panamá reveals that individuals from the Golfo Dulce area on the Pacific lowlands of Costa Rica attain a slightly larger size than do the frogs elsewhere in the range of the species, but that the difference is minor. For example, fifteen males chosen at random from each of three localities in Costa Rica vary in snout-vent length as follows: Golfo Dulce area, Puntarenas Province 33.8 (29.6-38.8 mm.); Puerto Viejo, Heredia Province 29.6 (27.9-32.3 mm.); Turrialba, Cartago Province 30.5 (27.9-32.6 mm.). Sixteen males (including the holotype) from the Golfo Dulce region display variation in the canthus, loreal region, size of discs on digits and size of choanae that extends from the condition described in *H. dulcensis* to that ordinarily found in *H. elaeochroa* on the Caribbean lowlands. The nearly identical breeding calls, close resemblance of tadpoles, and lack of any definitive morphological criteria indicate that *Hyla dulcensis* Taylor is a synonym of *H. elaeochroa* Cope.

Until Taylor named *Hyla dulcensis*, *Hyla elaeochroa* was not known from the Pacific coast of Central America. Subsequent collecting has extended the known range of *H. elaeochroa* westward through the Arenal depression in Guanacaste and southward along the Pacific slopes to the Golfo Dulce area.

Dunn and Emlen (1932:25) incorrectly placed *H. elaeochroa* in the synonymy of *H. rubra*. The former has no pattern on the posterior surfaces of the thighs, whereas the bold black and creamy

yellow pattern is present in *H. rubra*. A gap of about 225 kilometers separates the known ranges of the two species. *Hyla elaeochroa* ranges from east-central Nicaragua southward to the Golfo Dulce area of Costa Rica and on the Caribbean lowlands to Laguna de Chiriquí in western Panamá, whereas *Hyla rubra* is widespread in South America, but in Panamá ranges no farther west than the Canal Zone.

Hyla lancasteri Barbour

Hyla lancasteri Barbour, Proc. New England Zool. Club., 10:31, Pl. 4, fig. 2, March 2, 1928 [Holotype.—MCZ 13062, Peralta, Cartago Province, Costa Rica; C. R. Lancaster collector].

Hyla moraviaensis Taylor, Univ. Kansas Sci. Bull., 35:865, fig. 57, July 1, 1952 [Holotype.—KU 30284, Moravia, Cartago Province, Costa Rica; Edward H. Taylor collector].

Barbour (1928:31) named *Hyla lancasteri* on the basis of one juvenile having a snout-vent length of 19.1 mm. Dunn and Emlen (1932:25) placed *H. lancasteri* in the synonymy of *H. Boulengeri*. Taylor (1952:858) questioned that allocation of *H. lancasteri*. A comparison of the holotypes of *H. lancasteri* and *H. moraviaensis* with well-preserved specimens of *H. Boulengeri* (including juveniles) reveals that the latter is specifically distinct from both *H. lancasteri* and *H. moraviaensis*, but that the holotype of *H. lancasteri* is conspecific with the frogs that Taylor (1952:865) named *Hyla moraviaensis*. Although the type of *H. lancasteri* is in poor condition and the only markings present are the dark bars on the hind limbs, the species can be associated with *H. moraviaensis* by the broad head, short truncate snout, short fingers, and amount of webbing. In all of these characters *H. lancasteri* differs notably from *H. Boulengeri*, which has a relatively narrow head, long pointed snout, and relatively long fingers. Dunn and Emlen (1932:25) apparently synonymized *H. lancasteri* with *H. Boulengeri* solely on the basis of the strongly barred thighs, a coloration known at that time, in Central American hylids, only in *H. Boulengeri*.

Although many specimens of *Hyla lancasteri* are in collections, all are from the Caribbean slopes of Cartago Province, Costa Rica.

Hyla loquax Gaige and Stuart

Hyla loquax Gaige and Stuart, Occas. Pap. Mus. Zool. Univ. Michigan, 281:1, June 9, 1934 [Holotype.—UMMZ 75446, Ixpuc Aguada, north of La Libertad, Departamento El Petén, Guatemala; L. C. Stuart collector].

Hyla stadelmani Schmidt, Proc. Biol. Soc. Washington, 49:45, May 1, 1936 [Holotype.—MCZ 21310, Subirana Valley, Departamento Yoro, Honduras; Raymond E. Stadelman collector.]

Hyla axillamembrana Shannon and Werler, Trans. Kansas Acad. Sci., 58:383, fig. 6, September 24, 1955 [Holotype.—FAS 4083, 5 mi. south of Lake Catemaco on San Andrés Tuxtla-Minatitlán road, Veracruz, México; John Werler and Jack Reid collectors].

Hyla loquax is one of the most distinctive Middle American tree frogs; in living and freshly preserved specimens the thighs and webs are red, but in old preserved specimens the red fades to creamy white. Gaige and Stuart's (1934:2) description included an account of the coloration of living frogs (collected and observed by Stuart), but Schmidt (1936:45) had no acquaintance with the frogs in life that he named *Hyla stadelmani*.

I have compared the type and a paratype of *H. stadelmani* (MCZ 21310-11) with two paratypes of *H. loquax* (MCZ 19754, 21456) and several other specimens of *H. loquax* from Central American and southern México. These specimens obviously represent one taxon. The older preserved specimens of *H. stadelmani* and *H. loquax*, from which the colors have faded, are indistinguishable.

Duellman (1960:62) placed *Hyla axillamembrana* in the synonymy of *Hyla loquax*, which is widely distributed in the forested Gulf and Caribbean lowlands from southern Veracruz to Costa Rica.

Hyla melanomma bivocata Duellman and Hoyt, new combination

Hyla bivocata Duellman and Hoyt, Copeia, no. 4:414, figs. 1-3, December 19, 1961 [Holotype.—KU 58446, stream above (6.2 kilometers by road south of) Rayón Mescalapa, Chiapas, México; William E. Duellman and Dale L. Hoyt collectors].

Examination of specimens of *Hyla melanomma* (Taylor, 1940) and the acquisition of specimens from the Mexican state of Oaxaca provide evidence of close relationship of *H. bivocata* to *H. melanomma*. Both are small (snout-vent lengths of breeding males 26.1-29.9 mm.), yellowish-tan frogs having axillary membranes, acuminate snouts in dorsal view, and breeding calls consisting of a primary note followed by shorter secondary notes. These resemblances notwithstanding, certain differences exist between the frogs in the Chiapan highlands and those in the Mexican highlands west of the Isthmus of Tehuantepec. The most noticeable difference between *H. bivocata* from Chiapas and *H. melanomma* from Guerrero and Oaxaca is the much smaller tympanum of the former. Seven males of *H. bivocata* from above Rayón Mescalapa, Chiapas, have tympanum/eye ratios of 0.276-0.323 (mean 0.298), whereas the ratio in three samples of *H. melanomma* is higher—eight males from Agua del Obispo, Guerrero, 0.500-0.531 (0.514), seven from 12 kilometers north-northwest of San Gabriel Mixtepec on the Pacific

slopes of Oaxaca, 0.478-0.550 (0.511), and two from Campamento Vista Hermosa on the Atlantic slopes of Oaxaca, 0.368-0.419 (0.394). Aside from this measurable difference, the Chiapan frogs have slightly less webbing on the hands and fewer dark flecks on the dorsal surfaces, especially on the shanks, as compared with those specimens from Oaxaca and Guerrero.

Subspecific recognition of the populations seems to be warranted. Thus, *Hyla bivocata* Duellman and Hoyt becomes *Hyla melanomma bivocata*. It is known only from the northern slopes of the highlands of Chiapas, whereas *H. m. melanomma* occurs on the coastal slopes of the Sierra Madre del Sur in Guerrero and Oaxaca. Four specimens (KU 87112-5) are from Campamento Vista Hermosa on the northern slopes of the Sierra de Juárez in northern Oaxaca. The two adult males are intermediate between *H. m. bivocata* and *H. m. melanomma* in respect to the size of the tympanum relative to the eye, but in other characters are more nearly like *H. m. melanomma*.

Hyla pictipes Cope

Hyla punctariola pictipes Cope, Jour. Acad. Nat. Sci. Philadelphia, ser. 2, 8:106, 1876 [Syntypes.—USNM 30631, 30652, Pico Blanco, Limón Province, Costa Rica; W. M. Gabb collector].

Hyla punctariola moesta Cope, Jour. Acad. Nat. Sci. Philadelphia, ser. 2, 8:106, 1876 [Holotype.—USNM 30660, Pico Blanco, Limón Province, Costa Rica; W. M. Gabb collector].

Hyla punctariola monticola Cope, Jour. Acad. Nat. Sci. Philadelphia, ser. 2, 8:106, 1876 [Holotype.—USNM 30661, Pico Blanco, Limón Province, Costa Rica; W. M. Gabb collector].

Cope (1876:106) erroneously associated his specimens of hylids with Peter's *Hyla punctariola*, which actually is an *Eleutherodactylus* (Dunn, 1940:109). Taylor (1952:855, 878) is the only worker who subsequently treated these names, and he placed each as a distinct species of *Hyla*, although he had no new material and had not examined the types of *H. moesta* or *monticola*.

In April, 1964, Jay M. Savage and I examined the types of the three subspecies described by Cope in an attempt to determine which names, if any, were applicable to various hylids that we had collected in the highlands of Costa Rica. All four types are soft, badly faded, and partially deteriorated, thereby making accurate comparisons and determinations impossible. We were unable to distinguish these types from one another by any seemingly meaningful character and agreed that the differences observed in the types were encompassed in the range of variation displayed by series of a species that we had collected in Costa Rica. The names

and descriptions of all three taxa appear on the same page (Cope, 1876:106). The name that appeared first on the page is here chosen. *Hyla punctariola moesta* and *H. p. monticola* are relegated to the synonymy of *Hyla pictipes*.

Since this species have never been adequately described, the following description (based on KU 64643-87 from Río Poasito, Alajuela Province, Coast Rica) is provided: snout-vent length of 10 males 34.6 (32.0-36.7 mm.), of six females 42.2 (40.6-43.2 mm.); tibia slightly longer than half snout-vent length; snout truncate viewed laterally and acuminate viewed dorsally; top of head flat; diameter of tympanum about half diameter of eye; fingers long, stout, about one-fourth webbed; toes short, about two-thirds webbed; inner metatarsal tubercle elevated, flat, elliptical; outer metatarsal tubercle smaller, conical; tarsal fold lacking; palms, soles, ventral surfaces of proximal segments of digits bearing numerous conical supernumerary tubercles; anal sheath short; anal opening at level of middle of thighs, directed ventrally; skin or dorsum and limbs smooth; skin or belly granular.

The coloration of preserved specimens is dull brown or tan on dorsal surfaces of females and either uniform dark brown or dull brown with many darker spots dorsally in males. In females the flanks and anterior and posterior surfaces of the thighs are tan with cream-colored spots, whereas in males these surfaces are dark brown or black with smaller cream-colored spots. The ventral surfaces are creamy gray with moderate (usually in females) or heavy (usually in males) suffusion of dark brown.

In life, males have an olive-green dorsum with dark olive-green or brown spots; in females the dorsum is uniform pale green. Individuals of both sexes have brown flanks and thighs with yellow spots and a golden tan iris.

This stream-breeding *Hyla* occurs at elevations above 1500 meters in the Cordillera Central and in the Cordillera de Talamanca in Costa Rica.

Hyla staufferi Cope

Hyla staufferi Cope, Proc. Acad. Nat. Sci. Philadelphia, 17:195, October 1865 [Holotype.—USNM 15317, Orizaba, Veracruz, México; Francis Sumichrast collector].

Hyla culex Dunn and Emlen, Proc. Acad. Nat. Sci. Philadelphia, 84-24, March 22, 1932 [Holotype.—MCZ 16098, Tela, Departamento Atlantidad, Honduras; Raymond E. Stadelman collector].

Hyla altae Dunn, Occas. Papers Boston Soc. Nat. Hist., 8:61, June 7, 1933. [Holotype.—MCZ 17972, Summit, Canal Zone, Panamá].

After comparing the types of the three proposed names with series of well-preserved specimens from throughout the range of the species, I concur with Taylor (1952:865) that only one species is involved. *Hyla culex* was named and described on the basis of an adult male having a snout-vent length of 25.1 mm. In his key to the species of the *Hyla rubra* group in Central America, Dunn (1933:62) separated *Hyla culex* from other members of the group by the former having a tympanum that was one-third the size of

the eye; in the other recognized taxa the tympanum is larger. Examination of series of *Hyla staufferi* from throughout the range of the species reveals that the size of the tympanum is variable, and that the frogs in northern Honduras do not differ significantly from individuals from other parts of the range. In the description of the type, Dunn and Emlen (1932:24) mentioned the presence of a dark interorbital triangle, dorsolateral marks, and transverse dark marks on the limbs, but Dunn (1933:62) stated that *H. culex* lacked stripes. The holotype of *H. culex* is soft and faded, but dark dorsolateral stripes, a canthal stripe, and transverse marks on the limbs are faintly visible.

Dunn (1933:61) named *Hyla altae* on the basis of five males obtained at Summit, Canal Zone, Panamá, and compared these specimens with *Hyla rubra* and *boulengeri*. The holotype of *H. altae* is indistinguishable from individuals of *Hyla staufferi*, which lack dark transverse marks on the limbs. The pattern on the dorsal surfaces of the hind limbs varies from unicolor grayish tan to a pattern involving numerous dark flecks, a dark longitudinal stripe, or one or two dark transverse marks. Unicolor hind limbs are more prevalent in Panamá and Costa Rica than in other parts of the range.

The taxonomy of *Hyla staufferi* has been confused for many years. Cope (1887:14) placed *H. staufferi* as a subspecies of *H. eximia*. Günther (1901:262) considered *H. staufferi* to be a synonym of *H. eximia*. Gaige (1936:293) suggested that *H. culex* and *H. altae* might be conspecific, but regarded *H. staufferi* as a different species, although she correctly intimated that *H. staufferi* belonged in the *rubra* group and not with *H. eximia*. The only subsequent departure from this arrangement was that of Blair (1960), who placed *H. staufferi* in the *eximia* group on the basis of the similarity in breeding calls.

Skeletal features, especially the characteristics of the broad nasals and slender tegmen tympani, the body form of the tadpoles, and the absence of webbing between the first and second toes are some of the more significant characters that indicate relationships of *Hyla staufferi* with the *Hyla rubra* group. *Hyla staufferi* is the northernmost species in the group, which is predominately South American; *H. staufferi* ranges from Guerrero and southern Tamaulipas, México southeastward to the Bayano Valley of east-central Panamá at low and moderate elevations throughout Central America, exclusive of the wet tropical forests of the Caribbean lowlands.

Hyla uranochroa Cope

Hyla uranochroa Cope, Jour. Acad. Nat. Sci. Philadelphia, ser. 2, 8: 103, pl. 27, fig. 4, 1876 [Holotype.—USNM 30651, near Sipurio, Limón Province, Costa Rica; W. M. Gabb collector].

Hyla alleei Taylor, Univ. Kansas Sci. Bull., 35:831, fig. 48, July 1, 1952 [Holotype.—RCT 775, Isla Bonita, Heredia Province, Costa Rica; Richard C. Taylor collector].

Taylor (1952:837) examined the holotype of *H. uranochroa* and MCZ 10249 from La Loma, Panamá, but referred two specimens from Isla Bonita to a new species, *Hyla alleei*, which he distinguished from *H. uranochroa* on the basis of (1) lacking a white stripe above the anus, (2) having the diameter of the tympanum about one-half that of the eye (larger in *H. uranochroa*), (3) having only a vestige of web on hand (outer-fingers one-fourth webbed in *H. uranochroa*), and (4) lacking a distinct inner tarsal fold (moderately distinct in *H. uranochroa*). I have examined 139 specimens from Costa Rica and western Panamá, including the holotype of *H. uranochroa* and the paratype of *H. alleei* (CNHM 101375, formerly RCT 774). Of 20 specimens from the type locality, only four lack a white stripe above the anus; six of 15 from Moravia, Cartago Province, Costa Rica, apparently lack the white stripe. The nature of the tarsal fold is variable; in some individuals the fold is lacking and in others it is weak. In those specimens having a better developed tarsal fold, the fold is weak and extends only about half the length of the tarsus. The amount of webbing in the hand is slight; in no specimen are the fingers more than one-fourth webbed and some specimens have only a vestigial web between the outer fingers. The diameter of the tympanum of most specimens is 60 to 65 per cent of the diameter of the eye; I have seen no specimens having a tympanum/eye ratio of less than 53 per cent.

The absence of distinguishing characters of morphology and coloration together with the presence of only one kind of breeding call and one kind of tadpole is indicative of the presence of only one species. *Hyla uranochroa* is a distinctive stream-breeding frog living at elevations usually above 1100 meters, although in Costa Rica, individuals have been found at 650 meters at Ciudad Quesada, Alajuela Province and at 680 meters at El Tigre, Limón Province. The species occurs on the Caribbean and Pacific slopes of Costa Rica and is known from La Loma on the Caribbean slopes of western Panamá.

Hyla uranochroa is the only member of the genus in Central America having a bright green dorsum, creamy-yellow belly, white lateral stripe, and bright red eye. Two other apparently related, red-eyed species (*H. legleri* and *H. rufoculis*) differ in having dark olive-green or brown dorsal colors and noticeably different breeding calls.

Phrynohyas spilomma (Cope)

Hyla spilomma Cope, Proc. Amer. Philos. Soc., 17:86, August 1877 [Holotype.—unknown, Cosamaloapam, Veracruz, México; Francis Sumichrast collector].

Acrodytes modesta Taylor and Smith, Proc. U. S. Natl. Mus., 95:594, pl. 27, fig. 2, pl. 28, figs. 2-3, June 30, 1945 [Holotype.—USNM 115013, Cruz de Piedra, near Acacoyagua, Chiapas, México; Dr. and Mrs. Hobart M. Smith collectors].

In his revision of *Phrynohyas*, Duellman (1956) regarded *P. spilomma* and *P. modesta* as distinct species. The former was characterized by an irregular dorsal dark mark and distinct dark transverse bands on the limbs, whereas *P. modesta* was characterized by the absence of any dorsal markings, except scattered black spots. In 1956 *P. modesta* was known from eight localities in southern Veracruz and the Pacific lowlands of Chiapas, Guatemala, and El Salvador. Fugler (1960:10) reported *P. modesta* from British Honduras, and Neill (1965:88) noted that the color pattern in *Phrynohyas* from British Honduras varied from the nearly unicolor pattern of *P. modesta* to the pattern described for *P. spilomma*.

Examination of specimens of *Phrynohyas* collected since 1956 reveals two additional specimens from Veracruz, 19 specimens from Tabasco, and one from Honduras, in addition to those reported from British Honduras. Seventy-two specimens (AMNH 74377-90) from Cuyuta, 20 kilometers north of San José, Departamento Escuintla, Guatemala, show a range in variation encompassing that previously known in both *P. spilomma* and *P. modesta*. Some specimens in the series have a unicolored tan dorsum; in others the tips of the warts are dark brown. Some specimens have dark brown dorsolateral bands, and in others the mid-dorsal region also is dark brown. Therefore, it seems that the uniform tan dorsum is only an extreme, but common and widespread, color variant of *Phrynohyas spilomma*.

This intraspecific variation in coloration is like that noted in Amazonian *P. venulosa* by Duellman (1956:39).

LITERATURE CITED

- BARBOUR, T.
1928. New Central American frogs. Proc. New England Zool. Club, 10:25-31, pls. 1-4, March 2.
- BLAIR, W. F.
1960. Mating call as evidence of relations in the *Hyla eximia* group. Southwest. Nat., 5:129-135, November 1.
- BOULENGER, G. A.
1898. An account of the reptiles and batrachians collected by Mr. W. F. H. Rosenberg in western Ecuador. Proc. Zool. Soc. London, 1898: 107-126, pls. 10-18, June 1.
- BREDER, C. M., JR.
1946. Amphibians and reptiles of the Rio Chucunaque Drainage, Darien, Panama, with notes on their life histories and habits. Bull. Amer. Mus. Nat. Hist., 86:375-436, pls. 42-60, August 26.
- COPE, E. D.
1876. On the Batrachia and Reptilia of Costa Rica. Jour. Acad. Nat. Sci. Philadelphia, ser. 2, 8:93-154, pls. 23-28.
1887. Catalogue of batrachians and reptiles of Central America and Mexico. Bull. U. S. Natl. Mus., 32:1-98.
- DUELLMAN, W. E.
1956. The frogs of the hylid genus *Phrynohyas* Fitzinger, 1843. Misc. Publ. Mus. Zool. Univ. Michigan, 96:1-47, pls. 1-6, February 21.
1960. A distributional study of the amphibians of the Isthmus of Tehuantepec, México. Univ. Kansas Publ. Mus. Nat. Hist., 13:19-72, pls. 1-8, August 16.
- DUNN, E. R.
1924. Some Panamanian frogs. Occ. Papers Mus. Zool. Univ. Michigan, 151:1-12, pls. 1-2, July 1.
1931a. New frogs from Panama and Costa Rica. Occ. Papers Boston Soc. Nat. Hist., 5:385-401, August 18.
1931b. The amphibians of Barro Colorado Island. Occ. Papers Boston Soc. Nat. Hist., 5:403-421, October 10.
1933. A new *Hyla* from the Panama Canal Zone. Occ. Papers Boston Soc. Nat. Hist., 8:61-64, June 7.
1940. New and noteworthy herpetological material from Panama. Proc. Acad. Nat. Sci. Philadelphia, 92:105-122, pl. 2, November 18.
- DUNN, E. R., and EMLEN, J. T., JR.
1932. Reptiles and amphibians from Honduras. Proc. Acad. Nat. Sci. Philadelphia, 84:21-32, March 22.
- FUGLER, C. M.
1960. New herpetological records for British Honduras. Texas Jour. Sci., 12:8-13.
- GAIGE, H. T.
1936. Some reptiles and amphibians from Yucatan and Campeche, Mexico. Carnegie Inst. Washington Publ. 457:289-304, February 5.
- GAIGE, H. T. and STUART, L. C.
1934. A new *Hyla* from Guatemala. Occ. Papers Mus. Zool. Univ. Michigan, 281:1-3, June 9.
- GÜNTHER, A. C. L. G.
1885-1902. Biologia Centrali-Americana. Reptilia and Batrachia. Taylor and Francis, London, xx + 326 pp., 76 pls.

NEILL, W. T.

1965. New and noteworthy amphibians and reptiles from British Honduras. Bull. Florida State Mus., 9:77-130, April 9.

SCHMIDT, K. P.

1936. New amphibians and reptiles from Honduras in the Museum of Comparative Zoology. Proc. Biol. Soc. Washington, 49:43-50, May 1.

STEJNEGER, L.

1911. Descriptions of three new batrachians from Costa Rica and Panama. Proc. U. S. Natl. Mus., 41:285-288, August 14.

TAYLOR, E. H.

1940. Herpetological Miscellany. Univ. Kansas Sci. Bull., 26:489-571, November 27.
1942. New tailless Amphibia from Mexico. Univ. Kansas Sci. Bull., 28:67-89, May 15.
1952. A review of the frogs and toads of Costa Rica. Univ. Kansas Sci. Bull., 35:577-942, July 1.
1954. Additions to the known herpetological fauna of Costa Rica with comments on other species. No. I. Univ. Kansas Sci. Bull., 36:597-639, June 1.
1958. Additions to the known herpetological fauna of Costa Rica with comments on other species. No. III. Univ. Kansas Sci. Bull., 39:3-40, November 18.

Transmitted March 14, 1966.